



***Monodelphoxyuris dollmeiri* n. g., n. sp. (Nematoda: Oxyurida) from *Monodelphis emiliae* in Peru**

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Accepted for publication 20th November, 2002

Abstract

Monodelphoxyuris dollmeiri n. g., n. sp. is described from the caecum of *Monodelphis emiliae* (Thomas) (Marsupiala: Monodelphidae) collected in the eastern region of the Andes of Peru. *M. dollmeiri* n. sp. differs from the closest pinworm described from marsupials in the Neotropics (*Didelphoxyuris thylamisis* Gardner & Hugot, 1995) in having operculate eggs and males that possess a tip prolonged of tail and a different kind of area rugosa. Several other species of pinworms have been described from marsupials in Australia, but all are characterised by possessing of a buccal capsule that is strongly cuticularised with interradian lamellae. These structures are lacking both in *M. dollmeiri* and *D. thylamisis*. *Monodelphoxyuris* n. g. is characterised by a mouth opening into a depression and lateral alae composed of two longitudinal crests. Males possess an area rugosa composed of six ventral sagittal mamelons, a caudal extremity prolonged by a robust tip of the tail which is directed backwards, four pairs of genital papillae (two pairs lateral adanal and sessile, one pair just posterior to the spicule aperture, and the last pair at posterior extremity and pedunculate). Females possess an opisthodelphic uterus, a reflected ovary and operculate, unembryonated, oval eggs.

Introduction

Herein we provide the description of a new genus and species of nematode of the family Oxyuridae Cobbold, 1884 recovered from the caecum of individuals of the short-tailed opossum *Monodelphis emiliae* (Thomas) (Marsupiala: Monodelphidae) collected from the southeastern foothills of the Andes of Peru.

Materials and methods

Mammals were collected in live-traps, killed in chloroform and examined for helminths within a few minutes of death. Pinworms were collected from the large intestine and caecum and placed directly in 10% formalin solution. Specimens were studied with the light microscope as temporary wet mounts, first in water and later in lactophenol. We studied cross-sections made 'free-hand' using small pieces of razor blade and

a small brush. Drawings were made with the aid of a drawing tube.

***Monodelphoxyuris dollmeiri* n. g., n. sp.**

Type-material: Holotype male, allotype female and paratypes nos 1175, 1176 and 1177, respectively, in the Colección Helminológica, Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru.

Type-host: *Monodelphis emiliae* (Thomas) adult female, no. 14149 in the Mammal Collection of the Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima.

Site in host: Caecum and colon.

Type-locality and date of collection: San Martín, Rio Camisea, Cusco, Peru, 11°47'10" S, 72°42'5" W, 474 m.; collected on May 08, 1997.

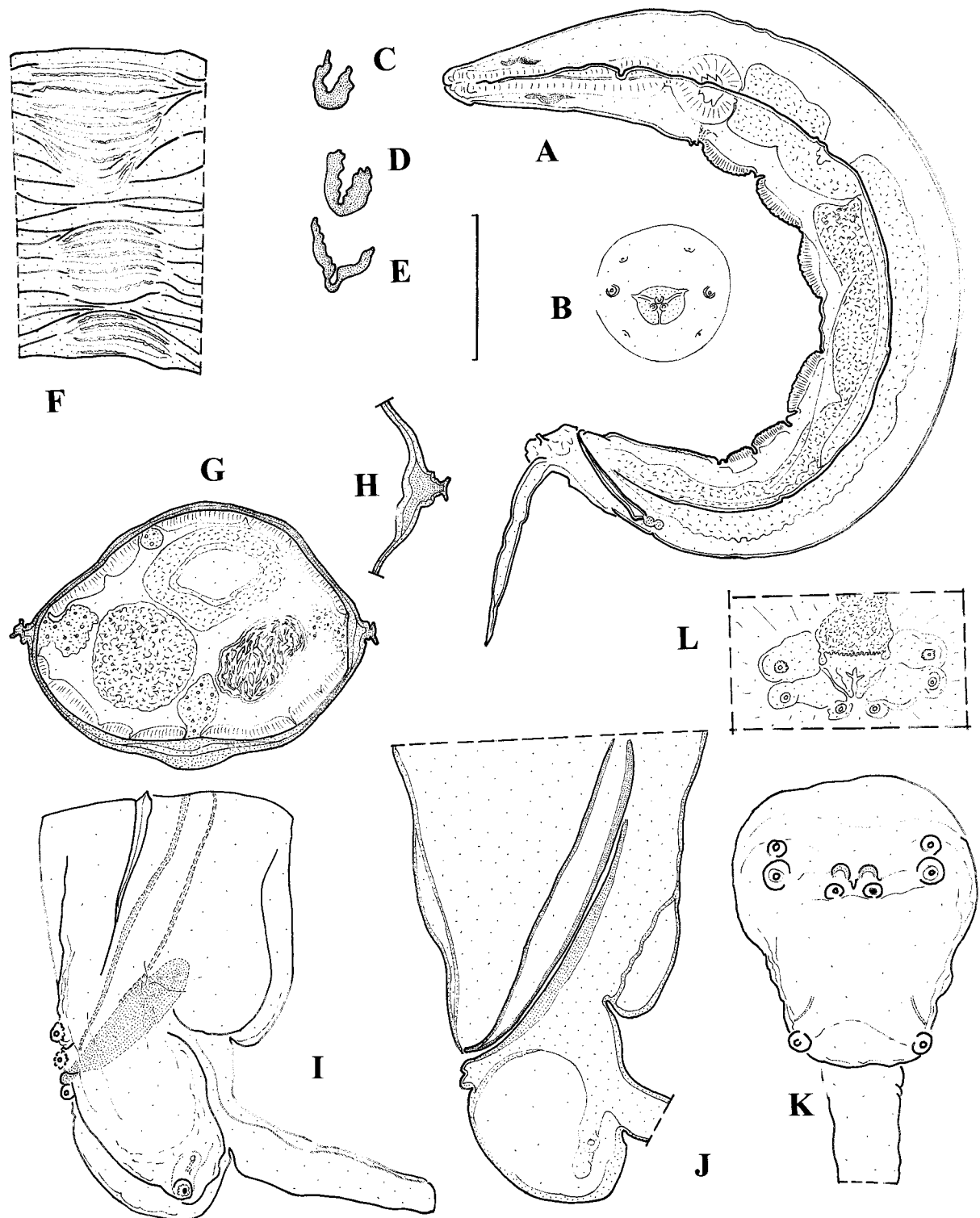


Figure 1. *Monodelphoxyuris dollmeiri* n. g., n. sp., holotype male: A, entire worm, left lateral view; B, head, apical view; C, D, E, three transverse sections of gubernaculum; F, ventral view, detail of the three posterior flattened mamelons; G, cross-section at level of mid-body; H, *idem*, detail of left lateral wing; I, left lateral view of caudal bursa; J, *idem*, sagittal optical section; K, *idem* ventral view; L, *idem*, detail of cloacal opening. Scale-bars: A, 160 μ m; B-E, H-L, 40 μ m; F, G, 70 μ m.

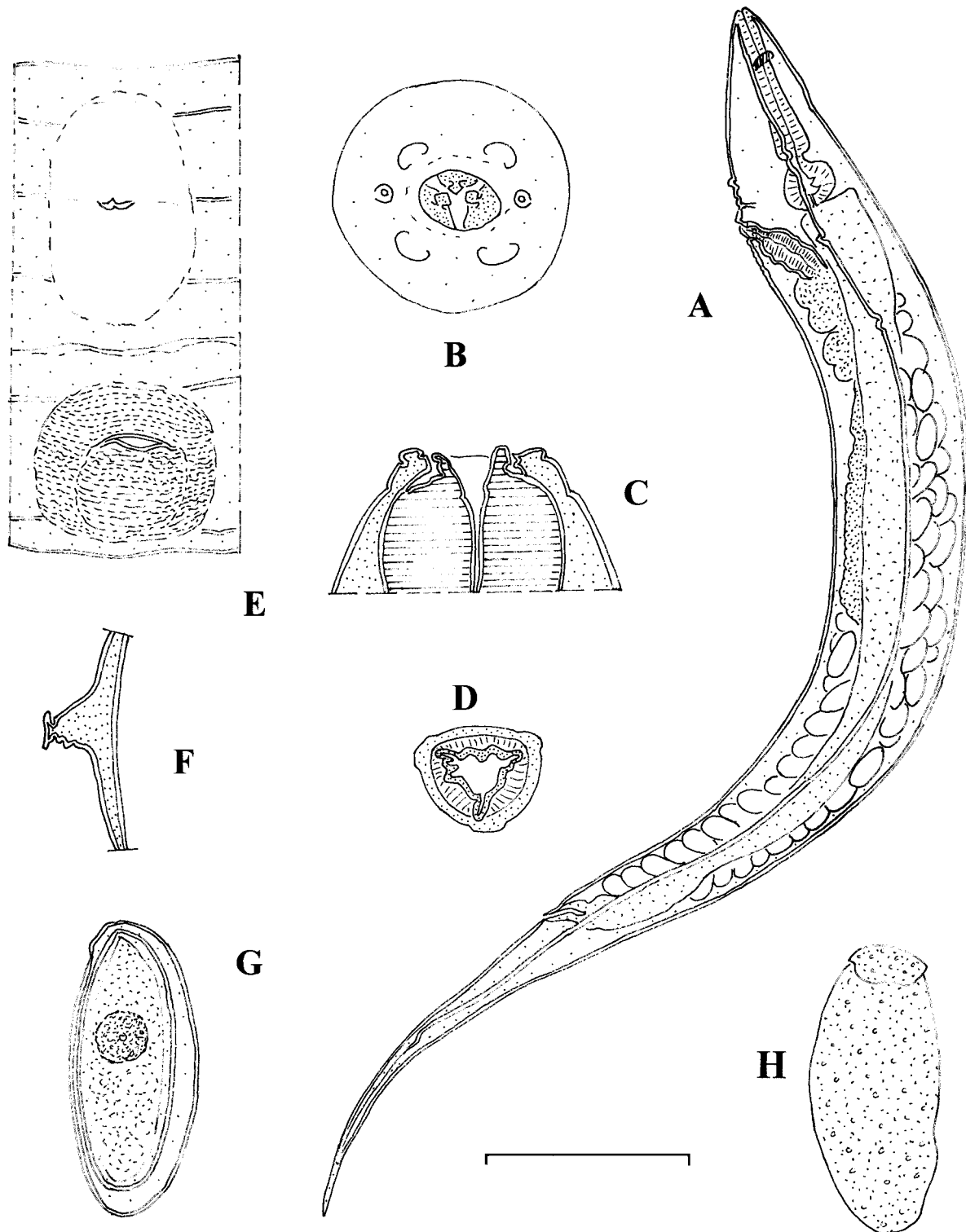


Figure 2. *Monodelphoxyuris dollmeiri* n. g., n. sp., allotype female: A, entire worm, left lateral view; B, head, apical view; C, optical section of head in ventral view; D, isthmus between corpus and bulb of oesophagus in cross-section; E, excretory pore and vulva in ventral view; F, detail of left lateral wing in cross-section; G,H, egg. Scale-bars: A, 400 μ m; B-F, 40 μ m; G,H, 72 μ m.

Description (Figures 1,2)

Holotype male. Small worm. Width gradually increasing posterior to cephalic region, reaching maximum at level of mid-body. Body terminating in long, stout tip of tail oriented backwards (Figure 1A). Mouth in depression surrounded by 3 narrow and partly fused lips, 4 submedian labial papillae, 2 weakly pedunculate amphids and 3 oesophageal teeth; each of latter terminated by conical denticule aligned forward in buccal cavity (Figure 1B). Cervical vesicle weakly developed. Lateral alae well developed, composed of 2 longitudinal crests, beginning closely posterior to head, ending anterior to cloaca (Figure 1A,G,H). Monorchic, with testis reflexing posterior to level of oesophageal bulb (Figure 1A). Area rugosa composed of 6 ventro-medial mamelons which are flattened and rounded in cross-section; first 3 mamelons begin just posterior to excretory pore, grouped together and of equal size; last 3 also grouped but separated from other 3 by gap; size of last 3 decreases posteriorly; on surface of mamelons, each inter-stria is interrupted by narrow, sinuous furrow (Figure 1A,F). Four pairs of genital papillae; 2 pairs lateral, adanal and sessile; 1 pair median, just posterior to spicule aperture; last pair posterior and pedunculate (Figure 1I-K); papillae of first 3 pairs are borne on small cuticular elevations (Figure 1L). Phasmids situated laterally and anterior to last pair of caudal papillae (Figure 1I-K). Anterior lip of cloaca indented and ornamented; extremity a hood-shaped flap from which spicular pouch protrudes; spicule pouch conical, ending into 2 peduncles (Figure 1L). Spicule weakly curved ventrally and well sclerotised, with sharp tip (Figure 1A,I,J). Gubernaculum present and well developed (Figure 1C-E,I,J).

Allotype female. Small worm, with body narrowing just posterior to vulva and terminating in long conical tail (Figure 2A). Cephalic vesicle weakly developed. Head exhibiting same arrangement as in males, but lips fused into narrow circular ring (Figure 2B). Lateral alae as in males, beginning anterior to nerve-ring, extending far posterior to anus (Figure 2A). Excretory pore and vulva closely adjacent, situated in first quarter of body (Figure 2A,E). Genital tract didelphic and symmetrical. Vagina with thick muscular wall (Figure 1A). Eggs operculate, oval with rounded poles, unembryonated (Figure 2G,H).

Measurements

See Table 1 (males) and Table 2 (females).

Monodelphoxyuris n. g.

Diagnosis

General. Mouth opening apically into depression surrounded by three indistinct lips, four submedian labial papillae and two weakly pedunculate amphids; cervical vesicle weakly developed; lateral alae present composed of two longitudinal crests. **Male.** Area rugosa composed of six flattened mamelons in two groups of three separated by gap; on surface of the mamelons, each inter-stria interrupted by narrow furrow; caudal region prolonged by stout tip of tail; four pairs of genital papillae: two pairs lateral adanal and sessile, one pair just posterior to spicule aperture, last pair posterior and pedunculate; phasmids situated laterally and dorsal to last pair of caudal papillae; spicule well sclerotised; gubernaculum present and well developed. **Female.** Cephalic vesicle weakly developed; excretory pore and vulva in close proximity, situated in first quarter of body; genital tract didelphic; vagina with thick muscular wall; eggs oval, operculated and unembryonated. Type-species: *M. dollmeiri* n. sp.

Etymology. This genus was named after the family of host from which individuals of the type-species were recovered. The species is named for Francisco Dollmeier, Head of the Project 'Biodiversity Assessment and Monitoring of the Lower Urubamba Region, Peru' during the course of which the host was collected.

Discussion

The closest relative of *Monodelphoxyuris dollmeiri* n. sp. is *Didelphoxyurus thylamisis* Gardner & Hugot, 1995, described from *Thylamys elegans* (Waterhouse) in Bolivia. *M. dollmeiri* differs from this species in having a weakly differentiated cephalic vesicle, a longer tail, operculate eggs, a different kind of area rugosa, a different arrangement and ornamentation of the cloacal aperture and the presence of a tip on tail in the male. *M. dollmeiri* also has different body proportions (Tables 1,2); male and females have a shorter body but are relatively wider, having a shorter oesophagus and a longer tail. In oxyuroids the differences observed in the genital characters of the males are generally highly specific and consistent in the same genus or family, especially in relation to the general arrangement of the genital tract, the characters of the area rugosa and the presence or absence of a tip of the tail, all of

Table 1. Measurements (in micrometres) of males of *Monodelphoxyuris dollmeiri* n. g., n. sp. Eleven individuals measured. Paratypes are sorted by increasing body size. Missing data are denoted by a '-'. For each line: mean is the mean; max. is the maximum and min. the minimum; 'CV' is the coefficient of variation.

	<i>Monodelphoxyuris dollmeiri</i> n. g., n. sp.														<i>Didelphoxyuris thylamisis</i>			
	holotype	m-3	m-4	m-10	m-6	m-2	m-9	m11	m-1	m-5	max.	min.	mean	CV	holotype	max.	min.	mean
amph (gap)	17	–	18	16	–	–	–	18	17	–	18	16	17	5	25	–	–	–
body L	1,377	1,230	1,235	1,361	1,410	1,422	1,422	1,430	1,488	1,507	1,507	1,230	1,388	7	2,578	2,578	1,309	1,718
W(head)	34	36	36	35	42	30	33	34	36	34	42	30	35	9	40	67	26	39
W(max)	163	154	175	164	183	180	163	191	168	183	191	154	172	7	165	338	165	266
W(nv)	72	76	78	71	74	72	70	74	78	79	79	70	74	4	97	128	65	91
W(blb)	143	138	139	142	151	144	147	158	150	150	158	138	146	4	140	190	102	140
W(ex)	140	140	130	143	162	150	144	167	143	157	167	130	148	8	190	242	151	199
W(as)	62	48	60	51	52	60	54	54	54	51	62	48	55	8	90	108	76	87
ospg L	318	298	292	310	326	306	318	326	324	331	331	292	315	4	330	342	194	268
blb W	76	72	72	76	77	78	76	80	84	80	84	72	77	5	105	105	78	90
blb L	75	76	74	77	80	72	78	80	90	80	90	72	78	6	100	100	61	78
apex to:																		
– nv	96	86	98	96	96	108	90	94	90	101	108	86	96	6	100	109	62	89
– lwa	106	52	62	96	28	102	68	103	63	72	106	28	75	34	–	–	–	–
– lwp	140	120	108	116	145	138	140	126	114	118	145	108	127	10	210	–	–	–
– ex	269	231	242	300	321	338	264	342	317	236	342	231	286	15	590	590	330	455
– test (bend)	521	473	298	654	395	477	363	420	505	359	654	298	447	23	515	–	–	–
– arug	456	244	248	318	316	390	285	342	342	326	456	244	327	19	600	–	–	–
T	252	220	232	230	246	256	234	256	253	248	256	220	243	5	42	65	42	55
Ttip	201	180	188	190	196	197	197	206	200	208	208	180	196	4	0	0	0	0
spc L	99	80	106	109	103	100	98	110	120	104	120	80	103	10	187	206	110	165
gub L	52	53	50	51	47	52	46	54	51	50	54	46	51	5	82	95	59	69
<i>bdyL/oespgh</i>	3.70	3.52	3.59	3.78	3.72	4.00	3.85	3.75	3.98	3.92	4.00	3.52	3.78	4	7.81	7.54	6.75	6.42
<i>bdyL/W</i>	7.21	6.82	5.98	7.14	6.63	6.81	7.52	6.41	7.67	7.10	7.67	5.98	6.93	7	15.62	7.63	7.93	6.47
<i>bdyL/gub</i>	22.62	19.81	20.94	22.96	25.83	23.56	26.63	22.67	25.25	25.98	26.63	19.81	23.62	10	31.43	27.13	22.19	24.84
<i>bdyL/spic</i>	11.88	13.13	9.88	10.74	11.79	12.25	12.50	11.13	10.73	12.49	13.13	9.88	11.65	9	13.78	12.51	11.9	10.41
<i>bdyL/excrt</i>	8.40	4.55	4.33	3.90	3.78	3.62	4.64	3.58	4.06	5.50	8.40	3.58	4.64	31	4.37	4.37	3.97	3.77
<i>ospgL/an</i>	3.31	3.47	2.98	3.23	3.40	2.83	3.53	3.47	3.60	3.28	3.60	2.83	3.31	7	3.30	3.14	3.13	3.01
<i>ospg/excrt</i>	2.27	1.29	1.21	1.03	1.02	0.91	1.20	0.95	1.02	1.40	2.27	0.91	1.23	32	0.56	0.58	0.59	0.59
<i>spic/gub</i>	1.90	1.51	2.12	2.14	2.19	1.92	2.13	2.04	2.35	2.08	2.35	1.51	2.04	11	2.28	2.17	1.86	2.39

Abbreviations: amph (gap), amphidial gap; body L, body length; W(max), W(head), W(blb), W(ex) and W(as), maximum body width, body width measured at level of head, oesophageal bulb, at excretory pore and anus, respectively; ospg L, length of oesophagus; blb L, length of oesophageal bulb; blb W, width of oesophageal bulb; apex to: nv, lw, ex, test (bend) and arug, distance from anterior end to nerve-ring, beginning of lateral ala, excretory pore, bend in testis and beginning of area rugosa, respectively; T, tail length; Ttip, tip of tail; spc L, length of spicule; gub L, length of gubernaculum.

The measurements of the holotype, and the range and mean for the male paratypes of the most closely related species, *D. thylamisis*, are given for comparison. The last 9 lines present several ratios between different parts of the body: in these ratios *bdyL* is the total length of the body minus the length of the tail.

Table 2. Measurements (in micrometres) of females of *Monodelphoxyuris dollmeiri* n. g., n. sp. Eleven individuals measured. Paratypes are sorted by increasing body size. Missing data are denoted by a '-'. For each line: mean is the mean; max. is the maximum and min. the minimum; 'CV' is the coefficient of variation.

	<i>Monodelphoxyuris dollmeiri</i> n. g., n. sp.															<i>Didelphoxyuris thylamisis</i>			
	allotype	f-4	f-6	f-11	f-9	f-3	f-10	f-3	f-7	f-2	f-1	max.	min.	mean	CV	allotype	max.	min.	mean
amph (gap)	21	24	24	23	23	24	22	28	24	24	–	28	21	24	8	22	–	–	–
body L	2,941	2,629	2,714	2,843	2,851	2,863	2,937	3,022	3,046	3,232	3,277	3,277	2,629	2,941	7	5,669	4,724	3,177	5,915
W(head)	37	40	38	41	48	40	42	65	41	44	38	65	37	43	18	61	54	42	84
W(max)	285	279	289	306	293	273	273	283	281	303	246	306	246	283	6	360	348	291	413
W(nv)	90	100	101	93	112	96	98	123	98	144	123	144	90	107	16	177	133	92	190
W(blb)	220	220	216	236	265	224	212	261	220	216	210	265	210	227	8	189	219	174	283
W(ex)	228	228	202	253	232	216	220	236	211	225	198	253	198	223	7	320	291	233	332
W(vlv)	273	277	261	293	289	244	249	260	261	276	240	293	240	266	7	289	–	–	–
W(as)	105	106	110	106	98	118	122	116	106	103	84	122	84	107	10	166	141	90	195
ospg L	445	413	407	440	428	440	428	428	407	426	414	445	407	425	3	390	368	338	390
blb W	104	108	110	112	106	104	106	105	104	108	108	112	104	107	2	120	131	120	146
blb L	108	106	104	104	100	104	102	109	106	102	102	109	100	104	3	130	118	103	130
vagina L	56	44	41	44	60	56	56	40	47	50	43	60	40	49	15	45	–	–	–
ovejector L	98	103	85	91	120	80	80	130	102	138	118	138	80	104	19	351	–	–	–
apex to:																			
– nv	100	112	116	103	102	100	99	94	98	186	162	186	94	116	26	140	115	83	145
– lwa	48	50	102	77	80	54	74	101	53	67	53	102	48	69	29	370	–	–	–
– lwp	211	226	200	220	200	200	293	–	294	–	265	294	200	234	17	–	–	–	–
– ex	444	391	400	460	346	407	444	362	371	432	378	460	346	403	9	680	587	509	685
– vlv	574	469	513	531	456	517	550	413	502	534	450	574	413	501	10	760	683	570	815
T	737	713	725	709	672	664	684	761	789	714	809	809	664	725	6	830	672	426	830
egg L	92	92	100	96	101	96	92	104	96	97	97	104	92	97	4	98	92	86	98
egg W	36	38	40	40	40	36	39	46	45	38	41	46	36	40	8	40	34	30	40
<i>bdyL/oespgh</i>	4.95	4.64	4.89	4.85	5.09	5.00	5.26	5.29	5.55	5.91	5.96	5.96	4.64	5.22	8	12.41	11.02	8.14	13.04
<i>bdyL/W</i>	7.73	6.87	6.88	6.97	7.44	8.05	8.25	8.00	8.03	8.31	10.03	10.0	6.87	7.87	11	13.44	11.64	9.45	12.31
<i>bdyL/excrt</i>	4.96	4.90	4.97	4.64	6.30	5.40	5.07	6.24	6.08	5.83	6.53	6.53	4.64	5.54	12	7.12	6.90	5.40	7.42
<i>bdyL/vlv</i>	3.84	4.09	3.88	4.02	4.78	4.25	4.10	5.47	4.50	4.72	5.48	5.48	3.84	4.47	13	6.37	5.93	4.83	6.24
<i>ospgL/an</i>	4.45	3.69	3.51	4.27	4.20	4.40	4.32	4.54	4.15	2.29	2.56	4.54	2.29	3.85	20	2.79	3.21	4.07	2.69
<i>ospg/excrt</i>	1.00	1.06	1.02	0.96	1.24	1.08	0.96	1.18	1.10	0.99	1.10	1.24	0.96	1.06	8	0.57	0.63	0.66	0.57
<i>eggL/eggW</i>	2.56	2.42	2.50	2.40	2.53	2.67	2.36	2.25	2.13	2.55	2.37	2.67	2.13	2.43	6	2.45	2.70	2.87	2.45

Abbreviations: amph (gap), amphidial gap; body L, body length; W(max), W(head), W(blb), W(ex), W(vlv) and W(as), maximum body width, body width measured at level of head, oesophageal bulb, at excretory pore, at vulva and anus, respectively; ospg L, length of oesophagus; blb L, length of oesophageal bulb; blb W, width of oesophageal bulb; apex to: nv, lw, ex or vlv, distance from anterior end to nerve-ring, beginning of lateral ala, excretory pore and vulva, respectively; T, tail length; egg L, length of egg; egg W, width of egg.

The measurements of the allotype, and the range and mean for the female paratypes of the most closely related species, *D. thylamisis*, are given for comparison. The last 9 lines present several ratios between different parts of the body: in these ratios *bdyL* is the total length of the body minus the length of the tail.

which are features upon which are based most of the groups currently recognised within the Oxyurida (see Petter & Quentin, 1976; Hugot, 1988; Hugot et al., 1996; Hugot & Baylac, 1996). Our specimens differ in these features from all other oxyurids; therefore, a new genus, *Monodelphoxyuris*, is proposed, which

includes only the type-species, *M. dollmeiri* n. sp., a parasite of *Monodelphis emiliae* in Peru.

Another species was previously described from a marsupial in the Neotropics, i.e. *Neohilgertia venusti* Navone, Suriano & Pujol, 1990 from *Thylamys venustus cinderellus* (Thomas) from Argentina.

Didelphoxyuris Gardner & Hugot, 1995 and *Monodelphoxyuris* n. g. differ from *Neohilgertia* Navone, Suriano & Pujol, 1990 in having only three oesophageal teeth, females that are didelphic, and males that possess no pre-anal papillae. Several other species of pinworms have been described from Australian marsupials (Johnston & Mawson, 1938, 1939; Mawson, 1964, 1978; Hugot & Bougnoux, 1988), but all are characterised by the presence of a strongly cuticularised buccal capsule with inter-radial lamellae (Petter & Quentin, 1976), structures which are completely lacking in Neotropical specimens. Also, in all males of the Oxyurida thus far described from Australian marsupials, the fourth pair of genital papillae is supported by very long, flexible peduncles, the tail has a thin, flexible caudal point and the phasmids are posterior to the last pair of genital papillae. Furthermore, in all of the female Australian pinworms, tracks of traumatic insemination have been observed (Hugot & Bougnoux, 1988). All this suggests that, currently, no special affinity can be found between the two genera *Didelphoxyuris* and *Monodelphoxyuris* and any other described genus or family of pinworms. However, these two genera do share some special characters (general arrangement of the cephalic structures, lateral alae and the arrangement of the genital papillae in the males), which suggest that they could be linked in the same taxonomic entity.

Although the helminths of marsupials from the Neotropics have a long history of study, starting most notably with the collections of Natterer from Brazil in the early 1800s described by Rudolphi (1819), Diesing (1851), Molin (1858) and later by Janicki (1906), pinworms have only recently been discovered in these mammals (Navone, Suriano & Pujol, 1990; Gardner & Hugot, 1995; present study). This lack of knowledge of the parasites of a relatively well known and widespread group of hosts is an indication of how little information is available to researchers interested in the biodiversity and parasitology of wild populations of vertebrates. However, the geography of the three localities where oxyurids were sampled from marsupial hosts, all of them on the south-eastern slopes of the Andes where some Quaternary refuges have been proposed (Colinvaux 1996), enables us to postulate a relictual distribution for a group of pinworms which were more diverse and more widely distributed in early times.

References

- Colinvaux, P.A. (1996) Quaternary environmental history and forest diversity in the Neotropics. In: Jackson, J.B.C., Budd, A.F. & A.G. Coates (Eds) *Evolution and environment in tropical America*. Chicago: The University of Chicago Press, pp.359–405.
- Diesing, K.M. (1851) *Systema helminthum*. Vol. 2. Vindobonae, 588 pp.
- Gardner, S.L. & Hugot, J.P. (1995) A new pinworm, *Didelphoxyuris thylamisis* n. g., n. sp. (Nematoda: Oxyurida) in Bolivian marsupials. *Research and Review in Parasitology*, **55**, 139–147.
- Hugot, J.P. (1988) Les nématodes Syphaciinae parasites de Rongeurs et de Lagomorphes. Taxonomie. Zoogéographie. Évolution. *Mémoires du Muséum National d'Histoire Naturelle, Paris, Sér. A, Zoologie*, **141**, 1–153.
- Hugot, J.P. & Bougnoux, M.B. (1988) Etude morphologique de *Austroxyuris finlaysoni* (Oxyuridae, Nematoda), parasite de *Petauroides volans* (Petauridae, Marsupialia). *Systematic Parasitology*, **11**, 113–122.
- Hugot, J.P., Gardner, S.L. & Morand, S. (1996) The Enterobiinae fam. nov. (Nematoda, Oxyurida), parasites of primates and rodents. *International Journal for Parasitology*, **26**, 147–159.
- Hugot, J.P. & Baylac, M. (1996) Comparative landmarks analysis of some Oxyuridae parasitic in primates and rodents, using the patterns of the caudal bursa of the males. In: Marcus, L.F., Corti, M., Naylor, G., Loy A. & Slice, D.E. (Eds) *Advances in morphometrics*. NATO ASI Series: Series A. New York: Pergamon Press, chap. 40, pp. 463–478.
- Janicki, C., von (1906) Studien an Säugetiercestoden. *Zeitschrift für Wissenschaftliche Zoologie*, **81**, 505–597.
- Johnston, T.H. & Mawson, P.M. (1938) Some nematodes from Australian marsupials. *Records of the South Australian Museum*, **6**, 187–198.
- Johnston, T.H. & Mawson, P.M. (1939) Some nematodes from Victorian and Western Australian marsupials. *Transactions of the Royal Society of South Australia*, **63**, 307–310.
- Mawson, P.M. (1964) Some Nematoda (Strongylina and Oxyurina), from kangaroos (*Macropus* spp.), from Eastern Australia. *Parasitology*, **54**, 237–262.
- Mawson, P.M. (1978) A new genus *Adelonema* (Nematoda: Oxyuridae) from Australian phalangerid marsupials. *Transactions of the Royal Society of South Australia*, **102**, 223–226.
- Molin, R. (1861) Trenta specie di Nematoidi. *Sitzungsberichte der Österreichischen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Klasse, Abteilung I*, **40**, 331–358.
- Navone, G.T., Suriano, D.M. & Pujol, C.A. (1990) *Neohilgertia venusti* gen. n. sp. n. (Nematoda: Oxyuridae) from *Thylamys venustus cinderellus* (Thomas) Reig, Kirsch & Marshall, 1985 (Marsupialia: Didelphidae) in Burrupacu, Tucuman, Argentina - Systematic position and possible evolution. *Memórias do Instituto Oswaldo Cruz*, **85**, 185–189.
- Petter, A. & Quentin, J.C. (1976) Keys to genera of the Oxyuroidea. In: Anderson, R.C., Chabaud, A.G. & Willmott, S. (Eds.). *CIH keys to the nematode parasites of vertebrates*. Farnham Royal: Commonwealth Agricultural Bureau, No. 4, 30 pp.
- Rudolphi, C.A. (1819) *Entozoarum synopsis cui accedunt mantissa duplex et indices locupletissimi*. Berlin, 811 pp.